Moderators of the Relationship between

Cognitive Bias and Depressive Symptoms

A Senior Honors Thesis

Presented in Partial Fulfillment of the Requirements for Graduation with Distinction in Psychology in the Undergraduate Colleges of the Ohio State University

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May, 2007

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Abstract

A central claim of the cognitive model of depression is that people with greater depressive symptoms show less optimistic and more pessimistic biases in several domains. While previous research (Strunk, Lopez, & DeRubeis, 2006) has supported this claim, much less is known about for whom or under what conditions this is most true. Replicating a previous study of bias in life event predictions, this study found that optimistic / pessimistic bias in life event predictions and depressive symptoms were related as predicted by the cognitive model of depression for women, but this was not true for men. However, this sex difference in the relationship between optimistic / pessimistic bias and depressive symptoms was not evident on a task involving participants predicting how they would be rated by a friend or significant other. A secondary purpose of this project was to examine whether bias in a particular domain (viz., interpersonal and achievement) and depressive symptoms were more related when participants had shown evidence of pessimistic explanatory style in that same domain. A significant interaction of optimistic /pessimistic bias for interpersonal events and depressive symptoms were obtained for participants who with pessimistic explanatory style for interpersonal events. A non-significant trend revealed a similar pattern for the achievement domain. Implications for potential refinements of the cognitive model and future research are discussed.

Introduction

An estimated 6.7 percent of American adults age 18 and older, approximately 14.8 million people, suffer from major depressive disorder each year (Kessler et al, 2005). Efforts to understand the causes of this complex and pervasive condition have led to the formation of a number of explanatory models. One of the central models is the cognitive model of depression (Beck, 1967, 1976). According to this model, individuals who are afflicted by depression hold inaccurate, distorted, and largely negative views. While therapies derived from Beck's cognitive model have acquired extensive empirical support (Clark, Beck, & Alford, 1999), testing one of the principal elements of the model has proven difficult. In particular, efforts to test Beck's notion that depressed individuals have inaccurate views have not produced consistent results.

Depressive Realism

Research conducted by Alloy and Abramson (1979) has been taken to suggest that depressed individuals do not hold distorted views. In one of a series of experiments, Alloy and Abramson set up a contingency task in which college students could chose to either press or not press a button. The likelihood that a nearby green light would illuminate was varied by the experimenters, and, as such, was completely independent of the students' button-pressing efforts. At the end of 40 trials, students were asked to estimate the extent to which their button pressing controlled the lighting of the bulb. Results indicated that students with very low levels of depressive symptoms overestimated their control of the light. In contrast, students with relatively high levels of depressive symptoms were more accurate when estimating their control of the light. Thus, differences in assessments of control between the dysphoric and non-dysphoric students suggest that non-dysphoric individuals are inclined to be optimistic about their levels of control, while dysphoric individuals are more realistic. Alloy and Abramson

(1979) maintain that these data support a depressive realism hypothesis. This hypothesis contends that depressed individuals hold more accurate views than their non-depressed peers.

Strunk et al. (2006) suggested that two versions of the depressive realism hypothesis might be posited. These are the depressive bias hypothesis and the depressive accuracy hypothesis (see Figure 1). The depressive bias hypothesis posits that people with more severe depressive symptoms tend to be more negatively biased in their judgments. While people with the lowest levels of depressive symptoms tend to be optimistically biased, those with the highest levels of depressive symptoms tend to be pessimistically biased. Thus, the depressive bias hypothesis is consistent with the Beck's cognitive model as both assert that individuals with high levels of depressive symptoms hold highly unrealistic and negatively biased views (Beck, 1967, 1976). The second hypothesis, the depressive accuracy hypothesis, maintains that the more an individual's level of depressive symptoms are elevated, the more accurate their judgment. According to this view, individuals who make the most accurate judgments are those who are experiencing the highest levels of depressive symptoms. This hypothesized relationship is represented by the asymptotic line in Figure 1. According to this hypothesis, those with low levels of depressive symptoms are optimistically biased. People with higher levels of depressive symptoms are less optimistically biased such that those with the highest levels of depressive symptoms show the least optimistic bias. According to this hypothesis, pessimistic bias is not evident in even the most depressed samples.

Some controversy has been generated by the depressive accuracy hypothesis. For decades, many researchers concluded that an accurate perception of reality was one of the defining characteristics of mental health (Taylor & Brown, 1989). Consistent with this widely held-notion, cognitive treatments for depression are structured such that therapists help

depressed people acquire less negatively biased and more accurate ways of making judgments (Beck, 1967, 1976). According to Beck, cognitive therapy relieves depressive symptoms by correcting pessimistic and inaccurate views. But some have argued the acquisition of mental health is associated with the adoption of an exceedingly positive sense of self and unrealistic amounts of optimism (Taylor & Brown, 1989). If it were true that accuracy in a person's thinking is most associated with the highest levels of depressive symptoms (in accordance with the depressive accuracy hypothesis), then this would have important implications for the cognitive model of depression. It would also likely have important implications for understanding the mechanism of change associated with the cognitive therapy for depression.

Previous attempts to investigate the depressive realism hypothesis have been limited by the absence of an unbiased standard of comparison for evaluating potential bias in judgments, a deficiency in the levels of depressive symptoms examined, and the examination of judgments in relatively inconsequential laboratory tasks (Ackermann & DeRubeis, 1991; Dobson & Franche, 1989; Haaga & Beck, 1995). With respect to the first of these concerns, Ackermann & DeRubeis (1991) maintain that the studies that have attempted to measure bias in judgment have utilized questionnaires that may have been predisposed to systematic bias. For instance, Lewinsohn, Mischel, Chaplin, and Barton (1980) studied judgments made by depressed patients, other psychiatric patients, and non-patients after a small group interaction. An independent observer rated each participant on 17 positive qualities, and each participant rated themselves on the same set of characteristics. Judgments made by depressed participants were compared to those provided by the observers in order to determine accuracy. Ackermann and DeRubeis (1991) argue that observers are often critical, so their ratings may have corresponded with the low self

ratings that depressed people are already inclined to bestow upon themselves. Thus, this may not have been a fair test of the depressive realism hypothesis.

Another methodological deficiency associated with prior depressive realism research is the absence of a full range of depressive symptoms among participants. The majority of participants included in studies of depressive realism have been college students with low or mild levels of depressive symptoms. Clinically depressed participants have rarely been included. Researchers have also differed in the level of symptom severity that they are willing to use when categorizing participants as depressed. In Alloy and Abramson's experiment (1979), participants with Beck Depression Inventory scores between 12 and 15 were considered depressed, but according to criteria set forth by other researchers (Kendall et al., 1987) these individuals would be classified as dysphoric. The lack of consistent classification is especially problematic because studying dysphoric individuals may not be functionally equivalent to studying those who are clinically depressed.

The final methodological concern associated with previous studies of depressive realism is the extensive use of laboratory-based tasks. According to Ackermann and DeRubeis (1991), the validity of the results obtained by Alloy and Abramson (1979) are limited by the lack of self-relevant, emotionally engaging activities. Reviewers of the depressive realism literature have noted that the strongest evidence for depressive realism (i.e., the depressive accuracy hypothesis) is derived from studies containing judgments that are not particularly emotionally-engaging or self-relevant (Ackermann & DeRubeis, 1991; Dobson & Franche, 1989). In one study that varied the extent to which judgments being made were consequential (Pacini, Muir, & Epstein, 1998), dysphoric individuals were only more accurate in making judgments of low consequence. When making judgments of relatively higher consequence dysphoric individuals were less

accurate. Assuming linear relationships, one would expect consequential judgments made by clinically depressed people to be even more negative and inaccurate.

Strunk et al. (2006) utilized a life event prediction that largely overcame these limitations. In this study, participants with higher levels of depressive symptoms exhibited higher levels of pessimism in a manner consistent with the cognitive model. The current study will employ a life event prediction paradigm similar to the one used by Strunk et al. (2006). In addition, this study will utilize a second measure of bias that also was chosen so as to minimize the limitations of previous research. This second task involves predictions of a significant other's ratings of the individual's personal qualities.

The present study focuses upon factors that may moderate the association between optimistic / pessimistic bias and depressive symptoms. First, sex will be considered as a possible moderator. Second, I will consider negative beliefs in particular domains as a moderator of the relationship between bias in the same domain and depressive symptoms.

The Cognitive Model Applied to Men and Women

Research has suggested men and women experience and cope with depression differently. Women experience depression more often than men (Kessler et al, 2003). Although several factors have been implicated in understanding sex differences in rates of depression, Nolen-Hoeksema (1987) has suggested that the way men and women cope with negative mood may play an important role. Nolen-Hoeskema suggests that women tend to cope with negative moods by ruminating, while men tend to cope with negative moods by engaging in a distracting activity. Ruminative thinking serves to prolong depressive episodes, since rumination takes the place of the instrumental, distracting activities that shorten the course of depression.

Another potential explanation for the sex differences in the incidence of depression centers upon differences in the extent to which men and women conceptualize interdependence. Gabriel and Gardner (1999) argue that men focus on the collective components of interdependence, while women focus chiefly upon their relationships with others. More specifically, men are apt to list group memberships as having self-defining relevance, while women are much more likely to consider their close interpersonal relationships self-defining.

In an exploratory analysis, Strunk et al. (2006) examined whether the relationship between optimistic / pessimistic bias and depressive symptoms differed between men and women. In their study, these relationships differed significantly such that optimistic / pessimistic bias and depressive symptoms were significantly negatively related for women (as predicted by the cognitive model and the depressive bias hypothesis), but this negative relationship was much weaker among men. If replicated, such a finding could be important. If pessimistic bias is only characteristic of depression in women, the cognitive model may not adequately characterize depression in men.

Domain Specificity and Optimistic / Pessimistic Bias

Another important element of Beck's cognitive model is that depressed people are thought to have specific negative beliefs. The content of the negative beliefs is thought to vary consistently among depressed people in a manner that allows two distinct forms of depression to be posited. In one of these forms, depressed people exhibit what Beck calls "sociotropic" beliefs. In the other form of depression, depressed people exhibit what Beck calls "autonomous" beliefs. Sociotropic beliefs are those beliefs that are concerned with interpersonal relationships, whereas autonomous beliefs are those beliefs that are associated with independence and achievement.

Previous research has suggested that the distinction between interpersonal and achievement relevant beliefs may be important. Research suggests that high levels of sociotropy increase the likelihood that a personal will be susceptible to stress in response to negative life events (Robins et al., 1995). Other research indicates that the intensity of stress associated with interpersonal life events is predictive of levels of depressive symptoms (Rude & Burnham, 1993). However, evidence in support of congruence between cognitive vulnerabilities in a specific domain and levels of depression has not been consistent (Cogswell & Spasojevic, 2006)

On account of this prior work, I sought to examine whether the relationship between optimistic / pessimistic bias for a particular domain (viz., interpersonal or achievement) and depressive symptoms would be greater for people who tended to have negative beliefs in the corresponding domain (viz., interpersonal or achievement). One of the most commonly used measures of negative beliefs is the Attributional Style Questionnaire (ASQ). The ASQ is a measure of the extent to which respondents attribute negative events to internal, stable, and global causes more than is true for positive events. Research has suggested that an overall pessimistic explanatory style places people at increased risk for depressive episodes (Alloy et al., 2006). Individual differences in explanatory style are assessed by asking respondents about a series of interpersonal or achievement events. Thus, one can examine respondents' attributional style for interpersonal and achievement events separately. The present study specifically examined optimistic / pessimistic bias for interpersonal events, presuming that bias in predicting such events would be more related to depressive symptoms among people with a more pessimistic explanatory style for interpersonal events. Similarly, the current study opted to examine optimistic / pessimist bias for achievement events under the assumption that bias in

predicting these types of events would be more related to depressive symptoms among people with a more pessimistic explanatory style for achievement events.

The Current Study

The current investigation sought to replicate and extend a previous study that found that the relationship between optimistic / pessimistic biases and depressive symptoms was predicted by the cognitive model of depression (Strunk et al., 2006).To address this relationship, the association between optimistic / pessimistic biases and depressive symptoms was examined in a manner that required participants to estimate the likelihood of future events in their lives. This technique examines a distinct form of bias (i.e., life event bias).The assessment of a second form of prediction bias required that participants predict how a significant other would rate them on several personality characteristics. The second form of bias was measured in order to improve upon the assessment of a single form of bias, as in Strunk et al (2006).

Following previous evidence (Strunk et al., 2006), I hypothesized that the relationship between optimistic / pessimistic bias and depressive symptoms would vary as a function of sex. It is also hypothesized that levels of depressive symptoms and bias in a given domain will be the most closely associated when participants have a pessimistic explanatory style for events in the same domain for which one is biased (i.e. interpersonal or achievement).

Methods

Participants

Eighty seven undergraduate students participated in this study. Most participants (82%) were between 18 and 19 years of age. The sample consisted of individuals who identified their ethnicities as White (87%), African American (8%), Asian (4%), and Other (1%). More women (63% of sample) than men (37% of sample) took part in this study. Participants who had

received prior treatment for depression comprised 15.3% of the sample. Students were invited to participate in this investigation on the basis of their prescreening scores on an inventory of depressive symptoms (BDI).

Measures

Beck Depression Inventory, Second Edition (BDI-II) (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961; Beck, Steer, & Brown, 1996).This self-report scale has been shown to document levels of depressive symptoms in a valid and consistent manner (Beck, Steer, & Garbin, 1988). The second edition of the BDI generates scores similar to those obtained on the original version of the BDI, though the scores on the BDI-II tend to be 1.54 points higher on the BDI-II than the BDI (Dozois, Dobson, & Ahnberg, 1998).Scores on the BDI-II range from 0 to 63, with higher scores being reflective of higher levels of depressive symptoms.

ASQ (Peterson et. al, 1982). This self-report measure of attributional style consists of 12 hypothetical events. Six events are positive and six are negative. There are 3 positive interpersonal events, 3 negative interpersonal events, 3 positive achievement events, and 3 negative achievement events. For each event, participants are asked to indicate the most likely cause of the event. They are then asked a series of questions about the cause they identified. Respondents rate the extent to which these causes are internal (or external), stable (or unstable), and global (or specific) on a 7-point scale. Individuals with a more pessimistic explanatory style tend to have scores that reflect a more internal, stable, and global sense of causality for negative events relative to positive events. The average rating of how internal (vs. how external), how stable (vs. how unstable), and how global (vs. how specific) each cause was for negative events was rated as being is referred to as the negative score. A similar index for positive events is referred to as the positive score. The total score is calculated by taking the positive score minus

the negative score. Separate total scores for interpersonal and achievement domains can also be calculated by restricting the events included in the calculations to the interpersonal or achievement domain.

Life Event Prediction and Assessment Questionnaire (LE-PAQ) – Prediction and Assessment versions (Adapted from Strunk, Lopez, & DeRubeis, 2006). Participants examined 40 life events associated with this measure at two time points. Initially, participants were given the LE-PAQ prediction version, in which they were asked to give a probability estimate of the likelihood that each event would happen in their lives during the next 30 days. Later, participants were asked to indicate whether or not these events had occurred in an LE-PAQ assessment version administered on the 7th day, 14th day, 21st day, and 35th day after their initial assessment. Each administration of the LE-PAQ assessment version required that subject required that subjects report only those events that had occurred in the time following the previous administration of the LE-PAQ (assessment version). For example, subjects taking the assessment version of the LE-PAQ on the 14th day after the initial administration of the LE-PAQ (prediction version) would be asked to report only those events that had occurred between the 7th and 14th days. Subjects taking the LE-PAQ (assessment version) 21 days after the original LE-PAQ (prediction) version would report events that happened in the time between day 14 and 21, and so on.

An index of the degree of optimistic or pessimistic bias in making predictions was calculated. In order to create this index, scores were assigned to each item. Probability estimates were all transformed onto a scale that ranged from 0 to 1. Event occurrence was recorded as 1 when an event occurred and 0 when an event did not occur. The score for desirable events was obtained by taking the participant's probability estimate and the event occurrence score (i.e., 1 if

the event happened or 0 if the event did not happen). Higher positive values of this difference score are taken as an index of greater optimism. Lower negative values of this difference are taken as an index of greater pessimism. The score for undesirable events was determined by subtracting the probability estimate for a given event from the event occurrence score. Similar to what was true for the difference scores for desirable events, values greater than 0 reflect participants' level of optimism. Values less than 0 indicate levels of pessimism. The average of the 40 differences scores (one for each event) is then calculated. This average is a measure of overall optimistic / pessimistic bias. Scores on this index have a maximum possible range of -1 to 1. A score of zero indicates the absence of any optimistic / pessimistic bias. Increasingly high values above zero indicate greater optimism. Values lower than zero indicate pessimism with the lowest values indicating the most extreme pessimism.

Optimistic / Pessimistic Life Event Bias in Interpersonal and Achievement Domains

Calculations of optimistic / pessimistic bias for life events (as described above) were also performed for a limited set of events that were interpersonal in nature. Likewise, a score of optimistic / pessimistic bias for life events was also calculated for a limited set of life events that were achievement related.

In order to determine which events were interpersonal in nature and which events were achievement-oriented, two raters independently rated each of the 40 events on a 7-point scale ranging from "completely interpersonal" to "completely achievement-related." An intra-class correlation coefficient (ICC) was used to assess rater agreement. The ICC for this rating was 0.87. After raters had made their independent judgments, they discussed any discrepancies in their ratings and arrived at a consensus judgment regarding each event. Each event was judged to be in the interpersonal domain only, the achievement domain only, or neither of these

possibilities. Based on these consensus judgments, 13 events were identified as being in the interpersonal domain and 9 events were identified as being in the achievement domain. Bias scores were calculated following the same procedures described above separately for the interpersonal and achievement domains. Thus, an achievement life event bias score and an interpersonal life event bias score were calculated.

Ratings of Personality Characteristics (RPC) (Adapted from Lewinsohn, Mischel, Chaplin, and Barton, 1980). Using this measure, participants made percentile-based predictions about how a significant other would rate their personality on several positive dimensions (e.g., assertive, popular, friendly). Following successful completion of the RPC, participants were given a packet with instructions for their significant other. The packet for the significant other contained the 21-item RPC questionnaire, demographic forms, and informed consent documents. Significant others were instructed to read and sign the materials regarding informed consent prior to completing any questionnaires. The significant other used their copy of the RPC questionnaire to rate the participant on the same set of positive personality traits for which the participants rated themselves. Percentile scores given by the participant and their significant other were compared in order to calculate a bias score for the participant. The difference of the predicted and actual percentile scores assigned for each item was averaged to form a measure of RPC bias. A score of zero on this measure indicated the absence of optimistic or pessimistic bias. Higher scores indicated greater optimism, while lower scores indicated greater pessimism.

Procedure

There were five time points at which data were collected from participants. Participants completed measures at an initial assessment (time 1), 7 days after the initial assessment (time 2),

14 days after the initial assessment (time 3), 21 days after the initial assessment (time 4), and 28-35 days after the original assessment (Time 5 - follow up).

The initial assessment (time 1) required that participants come to the Psychology building for a four hour session. At that time, participants received information about study procedures and were asked to provide informed consent. Consenting individuals completed LE-PAQ (prediction), BDI-II, and ASQ questionnaires on the computer. Participants also received instructions regarding having a friend or significant other completing RPC materials at the time 1 visit. It is important to note that all study participants completed the measures associated with the initial assessment (i.e., LE-PAQ (prediction),ASQ, and BDI-II), but a much smaller number (n=48) completed (and recruited a significant other to complete) the RPC questionnaire.

The second assessment (time 2) occurred 7 days after the original session. This assessment required that participants complete an online administration of the LE-PAQ (assessment). Participants were able to access the LE-PAQ through a password protected web site. Similar online assessments of LE-PAQ (assessment) occurred 14 days after the time 1 visit and 21 days after the initial visit.

The final administration of the LE-PAQ occurred 30 - 35 days after time 1. This assessment, which was called time 5, required that participants return to the Psychology Building. At that time, participants completed the final administration of the LE-PAQ (assessment). Upon completion of this task, participants were debriefed.

Results

Table 1 consists of means and standard deviations for study variables. Compared to convenience samples of college students, the mean BDI score was relatively high. Mean scores

on both measures of bias (i.e., life event bias and RPC bias) indicated that on average, participants displayed pessimism, as both scores were numerically below zero.

Prior to examining my central hypotheses, I examined the simple correlations of life event bias and depressive symptoms. The correlation between life event bias and BDI-II was r = -.37 (p=.0007). The correlation between RPC bias and BDI-II was also computed (r=-.43, p=.002). Thus, for both life event bias and RPC bias, participants with less optimistic bias (or more pessimistic bias) tended to have higher BDI scores. This is consistent with the depressive bias hypothesis.

My first hypothesis was that the relationship between bias and depressive symptoms would vary as a function of sex. To examine this hypothesis as it pertained to life event bias, a regression model was tested in which BDI was entered as the dependent variable and life event bias, sex and the interaction of life event bias and sex were entered as independent variables.[1] The interaction between life event bias and sex was significant ($t = 2.01$, $p = .04$, $n = 79$). This interaction is illustrated in Figure 2. As the figure shows, optimistic/pessimistic life event bias is negatively related to BDI-II scores for women, whereas this is much less true for men. I also examined correlations between life event bias and BDI-II separately for men and women. The relationship was particularly strong for women ($r = -.46$, n = 49, $p = .001$) but was much less robust for men ($r = -.14$, $p=.46$, $n=30$).

To examine this hypothesis as it related to RPC bias, a regression model was run in which BDI was entered as the dependent variable and RPC bias, sex and their interaction were entered as independent variables. The interaction between RPC bias and sex was not significant ($t = 1.02$, $p = .31$, $n = 47$). Correlations between RPC bias and BDI were r = -.73 (p = .002) for

men and r = -.27 (p=.13) for women. Thus, the direction of the correlations for men and women was opposite that which was observed for life event bias.[0]

Given this differential pattern of correlations for men and women, I conducted a series of t-tests for men and women on each of the study variables. As shown in Table 2, men and women differed significantly on BDI scores, but not for life event bias or RPC bias. Consistent with previous research, women reported moderately higher levels of depressive symptoms than men.

Domain specific attributional style and optimistic/pessimistic bias

My second hypothesis was that life event bias in a particular domain (i.e., interpersonal and achievement) would be more strongly related to depressive symptoms among individuals with a more pessimistic explanatory style in that same domain. I planned to examine this hypothesis in two separate models: one to address this hypothesis for the interpersonal domain, and the other to address this hypothesis for the achievement domain.

For the interpersonal domain, I used a regression model in which BDI-II served as the dependent variable. Attributional style for interpersonal events, bias for interpersonal events, and the interaction of those two variables were all entered as the independent variables in this model. The interaction term in this model was significant ($t = 2.45$, $p = .02$, $n = 70$). Figure 3 was constructed to illustrate the pattern of results that produced the significant interaction. Among people with a more pessimistic explanatory style for interpersonal events, the relationship between interpersonal life event bias and BDI-II was negative, as would be predicted by the cognitive model of depression. However, this was less true for individuals with more optimistic explanatory styles.

For the achievement domain, I used a regression model in which BDI-II served as the dependent variable. Attributional style for achievement events, bias for achievement events, and

the interaction of those two variables were all entered as independent variables in this model. The interaction term in this model was nearly significant ($t = 1.96$, $p = .05$, $n = 70$). Figure 4 was constructed to illustrate the pattern of results that produced the trend-level interaction. Among people with a more pessimistic explanatory style for achievement events, the relationship between achievement life event bias and BDI-II was negative, as would be predicted by the cognitive model of depression. However, this was less true for individuals with more optimistic explanatory styles.

Thus, the pattern of results for both interpersonal and achievement analyses indicated that the more that people had a pessimistic explanatory style in a particular domain, the higher the correlation between optimistic/pessimistic bias in that domain and BDI-II scores. While the pattern was similar for interpersonal and achievement domains, the interaction of interest only reached the .05 level of significance in the interpersonal domain.

Is Domain Specificity Necessary?

While the pattern of results for interpersonal and achievement domains was consistent with our hypotheses, it might also be accounted for by a simpler pattern of results. Perhaps bias is more related to depressive symptoms for participants who have more pessimistic explanatory style regardless of whether they exhibit negativity in both their attributional style and bias in the same domain. To examine this possibility, I used a regression model in which life event bias, overall ASQ score, and their interaction were examined as predictors of BDI-II scores. In this model, the interaction term was not significant ($t = 0.96$, $p = .34$, $n = 71$). Thus, this simpler pattern of elevated depressive symptoms being related to the combination of overall pessimistic explanatory style and overall life event bias was not supported.

Discussion

This study examined several potential moderators of the relationship between two measures of optimistic / pessimistic biases and levels of depressive symptoms. The two distinct measures of bias addressed in this investigation included bias in predicting future life events (i.e., life event bias) and bias in predicting how another person would rate one several dimensions of personality (i.e., RPC bias). In correlational analyses, both life event bias and PRC bias were significantly negatively related to depressive symptoms as predicted by the cognitive model of depression. Moderators of interest when examining the two types of bias as they related to BDI included sex and attributional style.

The first hypothesis investigated addressed sex as a potential moderator of the relationship between bias and BDI-II. In the first test of this hypothesis, sex was examined as a potential moderator of the association between life event bias and depressive symptoms as this had been found in previous research (Strunk et al., 2006). In the second test of the hypothesis, the relationship between RPC bias and levels of depressive systems was also predicted to vary as a function of sex. With respect to the first of these hypotheses, a significant interaction between life event bias and sex was identified. This interaction was due to optimistic/pessimistic life event bias being more closely associated with levels of depressive symptoms for women than for men.

Some previous research is consistent with the finding that pessimistic bias was significantly related to depressive symptoms for women, but not for men. Calvete & Cardeñoso (2005) suggest that sex differences in depression-associated cognitions may be attributable to females' tendency to engage in higher levels of self-focused cognition relative to men. This orientation towards self-focused depressive cognitions is part of what Nolen-Hoeksema (1987)

argues is the greater tendency for females to react to depressed mood with repetitive, ruminative cognitions. She maintains that these cognitions are centered on discerning the consequences and the meaning of the depressed mood and, as such do not tend to involve more action-oriented strategies. Depressed men, in contrast, are more apt to respond to depressed mood with instrumental, behaviors, like distraction, that serve to reduce feelings of failure and helplessness. Nolen-Hoeksema suggests that the differing strategies employed by men and women may partly explain why women can more easily access their negative cognitions. Presumably, the ease with which one can access negative cognitions may influence the degree to which one employs a pessimistic attributional style regarding the causes of events and a pessimistic bias in predicting future life events.

Testing sex as a moderator of the relationship between RPC bias and depressive symptoms did not yield a significant interaction. This was a less powerful test than that conducted for sex as a moderator of the relationship between life event bias and depressive symptoms, as there were fewer participants who completed the RPC bias measure. An examination of the correlations between RPC bias and depressive symptoms revealed that this correlation was more numerically stronger (more negative) for men as compared to women. This is opposite the pattern observed for the analysis of life event bias. This suggests that lack of power alone may not explain the discrepant results for life event bias and RPC bias.

I also investigated the idea that life event bias in a specific domain would be more closely associated with depressive symptoms for individuals possessing a more pessimistic explanatory style in the same domain. More specifically, I posited that the relationship between interpersonal life event bias and level of depressive symptoms would be the most strongly related in participants with a pessimistic explanatory style for interpersonal life events. With respect to

this relationship, individuals with a pessimistic explanatory style for interpersonal events and high levels of bias in predicting interpersonally-relevant life events were significantly more likely to report high levels of depressive symptoms. This relationship was not as strong for individuals with more optimistic explanatory styles.

The other hypothesis relevant to the domain-specificity issue predicted that the association between achievement life event bias and level of depressive symptoms would be the most pronounced for participants with a pessimistic explanatory style for achievement events. The interaction between attributional style for achievement events and bias for achievement events was nearly significant, suggesting that there was a trend for life event bias and depressive symptoms to be more strongly related for individuals who reported more pessimistic explanatory styles. This relationship was weaker among individuals with an optimistic explanatory style for achievement related events. Although the relationship for achievement events and bias did not reach significance, this was the same pattern as observed for the interpersonal domain.

Limitations

While the current investigation yielded valuable evidence regarding specific moderators of the relationship between bias and depressive symptoms, a few limitations deserve to be addressed. First, the data obtained in the present study was cross sectional in nature. Thus, the correlations identified were not examined as predictors of change in depressive symptoms.

Second, the standard by which optimistic / pessimistic biases were assessed were imperfect. Both reports of which events occurred and ratings provided by participants' friends or significant others were potentially imperfect. The greatest concern one might have would be that these indices would be biased in a way that could have led to the results of interest. As noted in Strunk et al. (2006), a tendency for people with more depressive symptoms to under-report

desirable events and over-report undesirable events would not have led to the negative correlation between optimistic / pessimistic bias and depressive symptoms. While I cannot rule out some kind of systematic bias in the measures of optimistic / pessimistic bias, I have no reason to believe such a bias would produce the pattern of results observed in the present study.

Third, as the measures of optimistic / pessimistic bias are relatively new measures, little is known about their psychometric properties. Future research might assess the test-retest reliability of these measures and assess how the measures related to other depression-relevant variables.

Another limitation concerns the finding associated with sex as a moderator of the relationship between life event bias and BDI-II. While evidence was found to suggest that life event bias and levels of depressive symptoms were more strongly related for women than men, the specific factors influencing this effect were not investigated. More specifically, further research is needed to determine precisely what features associated with being a woman or a man might account for this effect.

A final limitation associated with the present line of research concerns the influence of correcting bias. It is not clear whether attempts to foster less pessimistic biases in predicting future life events would differentially influence depressive symptoms in women compared to men. This is a potentially useful avenue for future research.

Conclusion

Despite these limitations, the current investigation found evidence consistent with the idea that sex serves as a moderator of the relationship between optimistic / pessimistic bias in predicting future life events and depressive symptoms. In other words, optimistic/pessimistic life event bias is negatively associated to BDI-II scores for women far more so than for men. This

represents a replication of the effect discovered by Strunk et al. (2006) and, as such, it can be interpreted with greater confidence. However, the same pattern of results did not emerge for a measure of optimistic / pessimistic bias in predicting the ratings of a friend or significant other. However, these results must be interpreted in the context of the larger study, which demonstrated that optimistic / pessimistic bias in predicting life events is related to levels of depressive symptoms in a manner that is consistent with the cognitive model of depression. Interpersonally-oriented explanatory style also emerged as a significant moderator of the relationship between interpersonal bias in predicting life events and levels of depressive symptoms. Domain-specificity associated with the achievement dimension moderated achievement life event bias and levels of depressive symptoms at a trend level. Participants with the most negative explanatory styles for interpersonal events exhibited the strongest correlations between bias in predicting interpersonal life events and depressive symptoms. Thus, those with the highest levels of depressive symptoms tended to have the most pessimistic explanatory style for interpersonal events and the most pessimistic bias in their predictions of interpersonal events. Although the key interaction was non-significant (i.e., $p = .05$) for the achievement domain, the pattern of results was very similar. Study evidence consistent with the idea that depressed individuals are pessimistically biased in their predictions of future life events is contradictory to the depressive realism hypothesis. Evidence of moderators of this relationship may help to further refine the cognitive model of depression. More research is needed to better understand some of the effects seen in the present study and investigate other factors implicated in identifying under what conditions optimistic / pessimistic bias and depressive symptoms are most related.

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Footnote

[1] For all regression models testing interaction terms, the independent variables in the models were centered to a mean of zero, prior to examination of the models.

Table 1

Means, Standard Deviations, and Sample Size for Study Measures

Variable	M	SD	N
Optimistic / Pessimistic Bias			
Life event Bias	-.01	.09	79
RPC bias	-7.23	12.97	48
Domain Specific Life Event Optimistic / Pessimistic Bias			
Achievement Bias	.03	.16	70
Interpersonal Bias	-.04	.13	70
Attributional Style Questionnaire			
Overall ASQ total score	.37	1.10	87
Achievement ASQ total score	-.14	1.34	70
Interpersonal ASQ total score	.68	.89	70
Depressive Symptoms			
Beck Depression Inventory	12.62	11.70	87

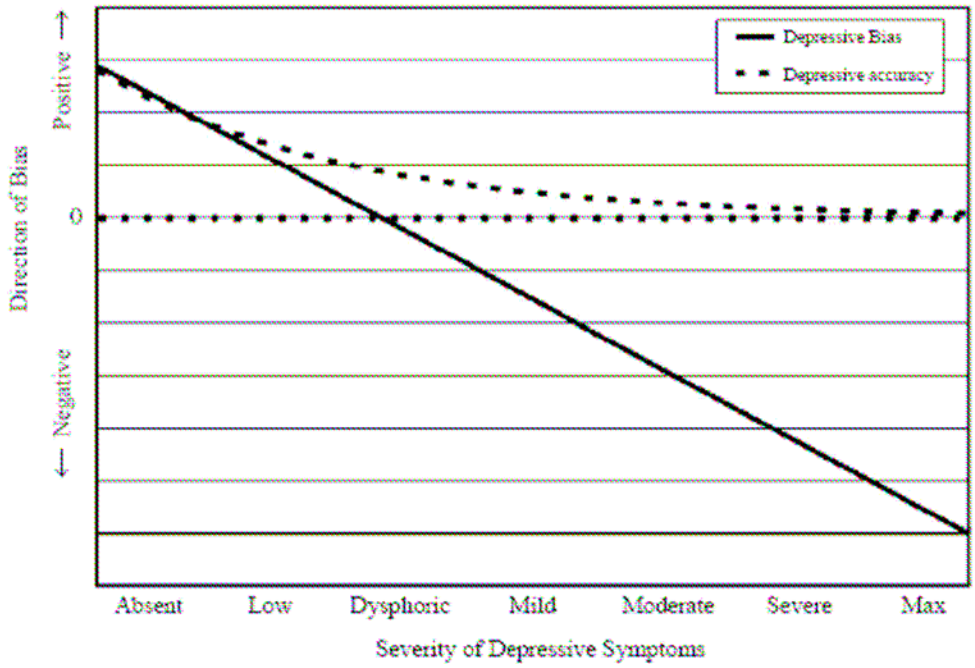
Table 2

T-tests of Sex Differences in Life Event Bias, Rating of Personal Characteristics Bias, and Beck Depression Inventory-II Scores

	Men			Women					
Variable	M	SD	N	M	SD	N	*t*	*p*	*d*
BDITime1sum	9.09	7.01	33	14.78	10.75	54	-2.46	0.02	-0.60
PALweekassesmean	.01	.07	30	-.02	.07	49	1.45	0.15	0.43
RPCavg21	-3.79	10.44	15	-8.79	9.86	33	1.25	0.22	0.47

Figure 1

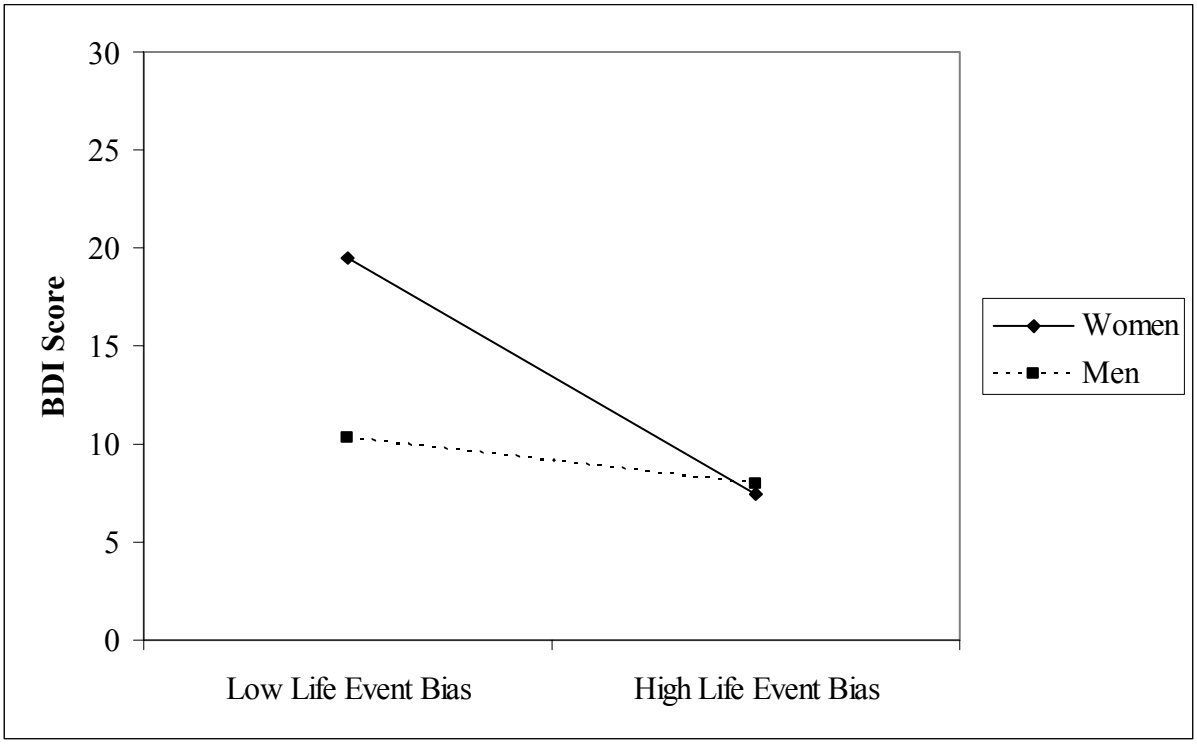
A graphical representation of depressive bias and depressive accuracy, two forms of the depressive realism hypothesis



Note. Reproduced from Strunk, Lopez & DeRubeis (2006).

Figure 2

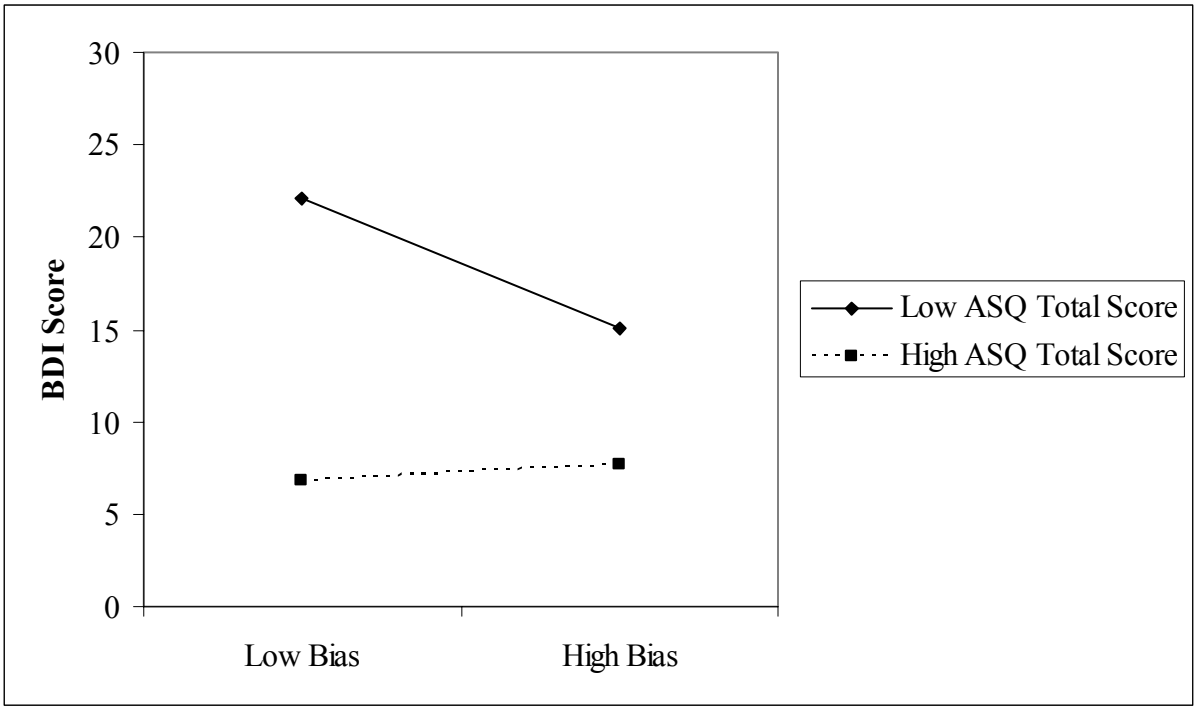
Sex as a Moderator of the Relationship between Life Event Bias and Beck Depression Inventory-II Scores



Note. Using a regression model in which life event bias, sex, and their interaction were examined as predictors of BDI-II scores, BDI-II scores were estimated for hypothetical men and women participants with values 1 standard deviation above or below the mean on life event bias. These predicted BDI-II scores are shown in the figure.

Figure 3

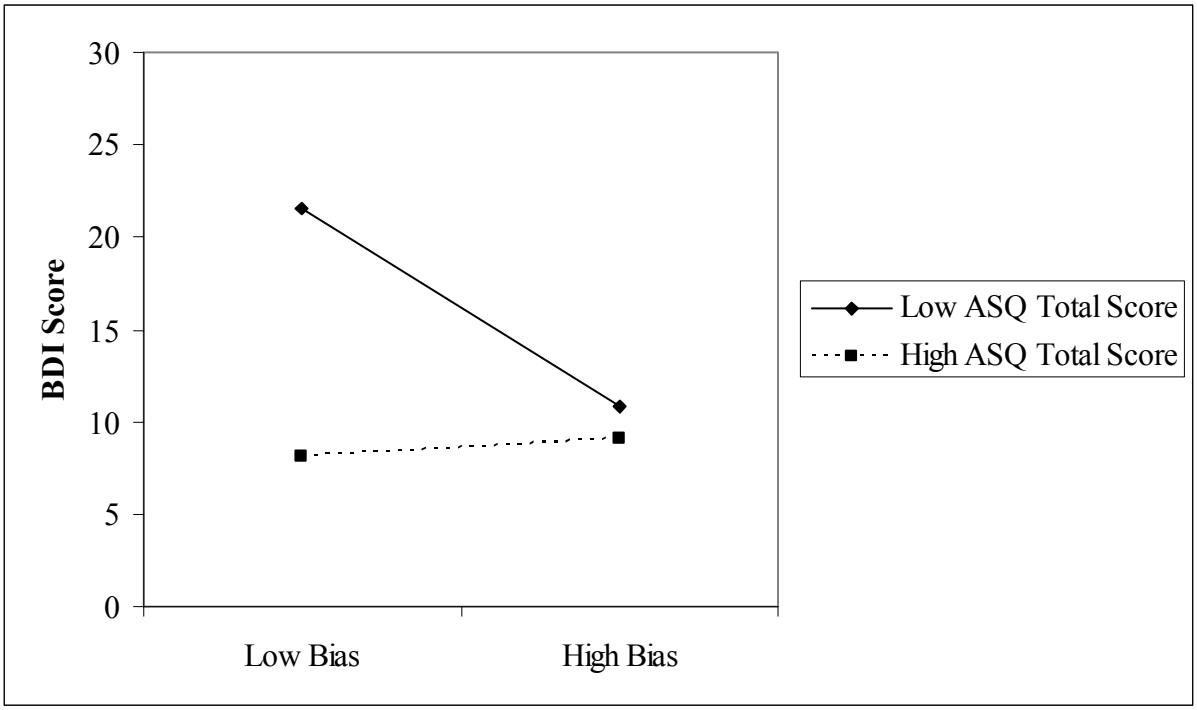
Interpersonal ASQ difference score as a Moderator of the Relationship between Interpersonal Life Event Bias and Beck Depression Inventory-II Scores



Note. Using a regression model in which interpersonal life event bias, interpersonal ASQ difference score and their interaction were examined as predictors of BDI-II scores, BDI-II scores were estimated from the model for hypothetical participants with values 1 standard deviation above or below the mean on ASQ difference score and 1 standard deviation above or below the mean on interpersonal life event bias.

Figure 4

Achievement ASQ difference score as a Moderator of the Relationship between Achievement Life Event Bias and Beck Depression Inventory-II Scores



Note. Using a regression model in which achievement life event bias, achievement ASQ difference score and their interaction were examined as predictors of BDI-II scores, BDI-II scores were estimated from the model for hypothetical participants with values 1 standard deviation above or below the mean on ASQ difference score and 1 standard deviation above or below the mean on achievement life event bias.